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Reflections on 40 Years of HM Assessment

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A Rangeland Conundrum

HM is among most influential events in rangeland profession, but we remain uncertain as to why.

- Was our profession predisposed to HM?
- Claims have always been unsupported.
- Current research consistent with prior results.
- What contributes to the persistence of HM?
- What lesson can/should be learned?

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U.S. Grazing Systems Origin

- Response to rangeland degradation (1870-1930)
- Arthur Sampson's plot research; USFS 1919
  - ✓ Deferred rotational grazing
  - ✓ Continued grazing; grass recovery from seed
- Hormay introduced rest-rotation; USFS 1958
- Clementsian succession provided reference
- Savory promoted enhanced production in addition to restoration; early 1980's in U.S.

Briske et al. 2011
Sayre 2017

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Principles of Holistic Management

"HM *helps people develop strategies* for managing herds of domestic livestock that mimic wild herds to heal the land"

- Nature functions in wholes
- All environments are different
- Properly managed livestock can improved land health
- Time is more important than animal numbers [in proper livestock management]

Savory Institute 2013
Sherren & Kent 2017

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Purported Ecological Benefits

- Increased control of grazing patterns
- Improve species composition
- Enhance forage quality
- Increase plant production/stocking rate
- Improve soil surface hydrology
- Greater C sequestration

Briske et al. 2008

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Savory TED Video

March 2013

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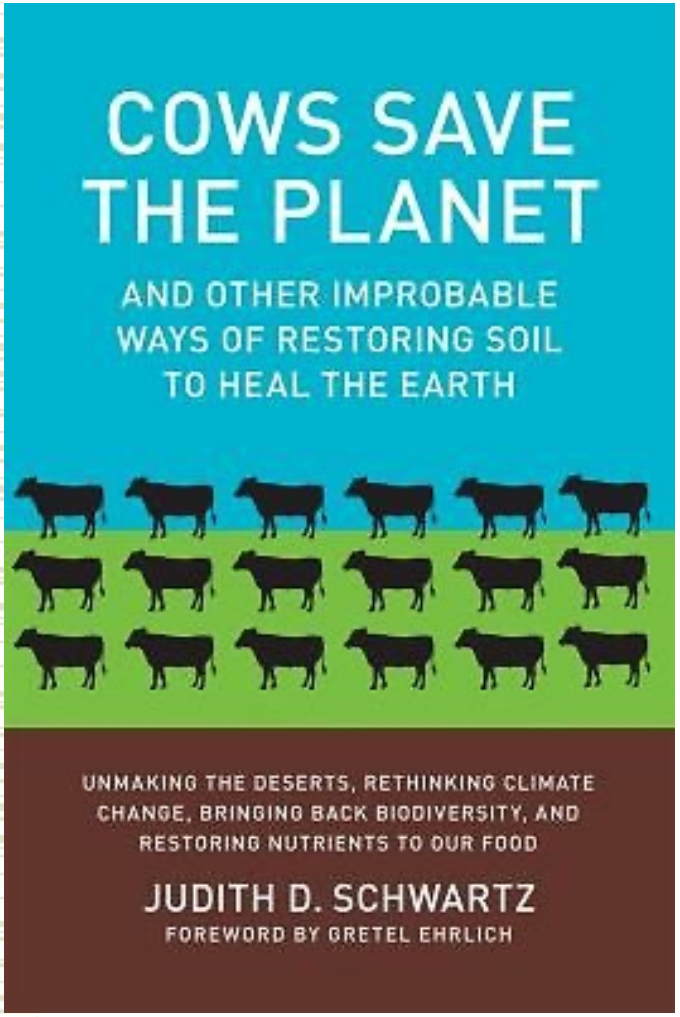
Claims Made in Savory TED Video

- "There is only one option left …, that is to do the ***unthinkable***, and use livestock in bunches and moving as a proxy for former herds and predators".
- "We can not reduce animal numbers to rest [grasslands] more without ***causing*** desertification and climate change".
- "We can take enough CO_2 out of the atmospheric [by using my grazing method] on half of worlds grasslands to take us back to ***preindustrial*** levels".

Grandiose Cowspircies



"This book makes me happy. Soil processes are amazing! I'm glad some smart people know what's what".

"Good interlocking journalistic treatment of soil regeneration……".

"Great ideas with some valid reasoning on how you can manage soil to improve quality".

"Forget cows burping and farting. Get them out there on the soil and keep them moving!"

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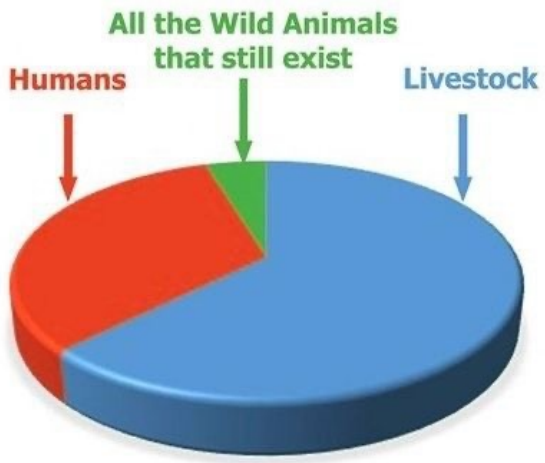
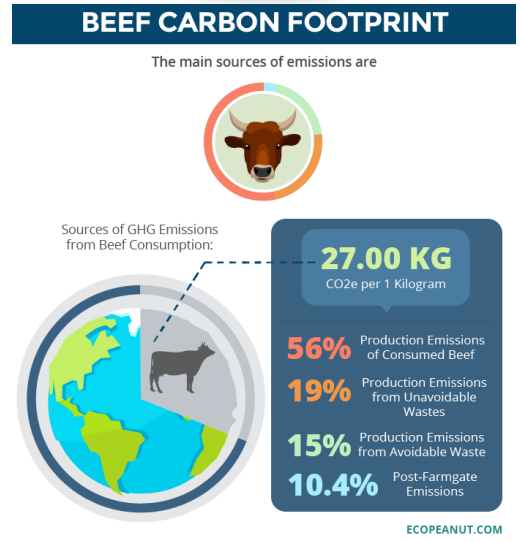
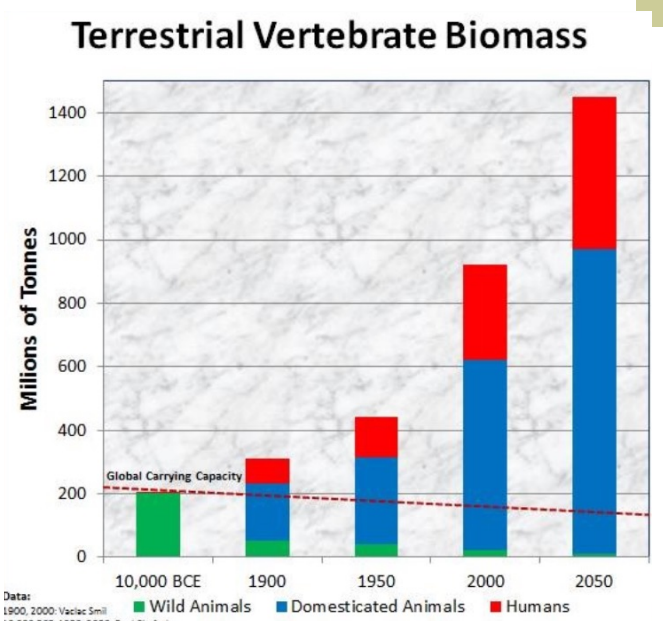
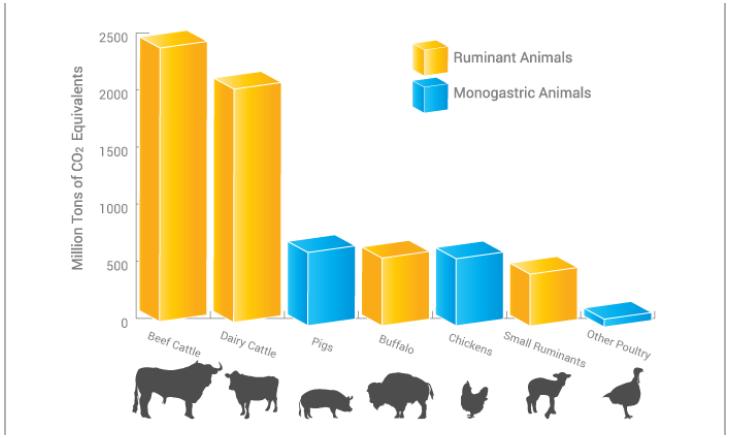
Beef Ecological Footprint

Biomass of all the land mammals on planet Earth:









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Holistic Management – What is it?

Multiple components and meanings

- Intensive rotational grazing
  - ✓ Intensive grazing period with moderate deferment
- Adaptive management
  - ✓ Improved monitoring and decision making
- Human perception
  - ✓ Stewardship, agency, and well-being

Savory Institute 2013
Sherren & Kent 2017

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Valid Reasons to Rotationally Graze

- Infrastructure and logistics
- Rangeland heterogeneity
- Wildlife considerations
- Water availability
- Disease/ectoparasites
- Invasive species

Rotational grazing is common, but not ***intensive*** application is ***not***.

Kachergis et al. 2014
Roche et al. 2015

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Benefits of RG Consistently Challenged

- Sampson 1951
- Heady 1961
- O'Reagain & Turner 1992
- Holechek et al. 2000
- Briske et al. 2008
- Hawkins 2017

Yet, HM persists!

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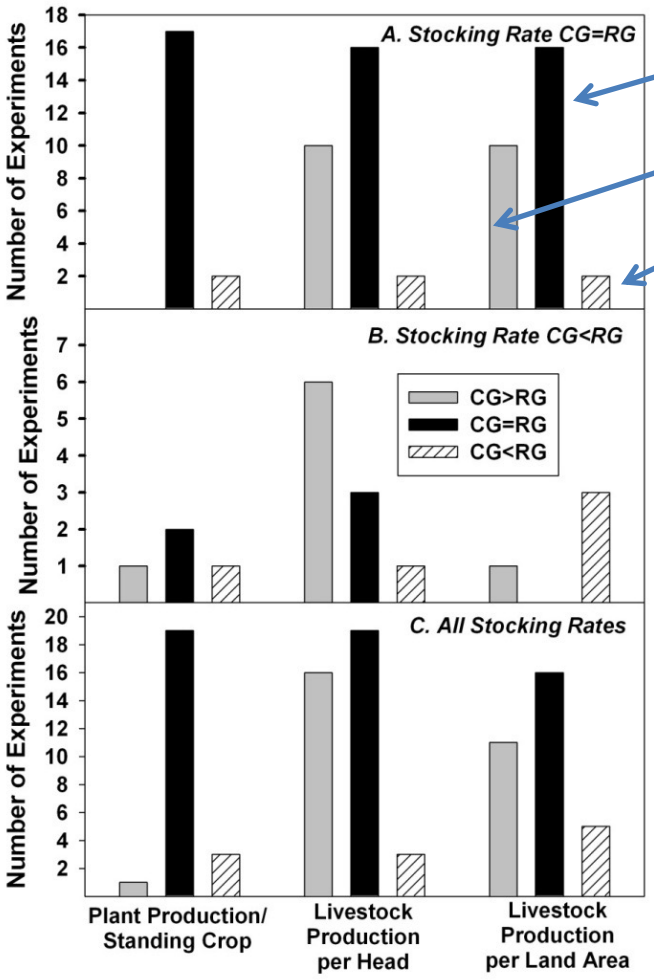
Majority (84-92%) of experiments show no advantage of rotational grazing for plant and animal production.



CG = RG

CG > RG

CG < RG

40 experiments
300 – 750 mm year

Briske et al. 2008

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Grazing Prevents Degradation

- Refuted by long-term (>25 yrs) vegetation records
  - ✓ Stable community composition of ungrazed areas
  - ✓ Positive responses to grazing exclusion
- Ecological processes often not improved by grazing
  - ✓ Infiltration and soil organic carbon content
  - ✓ Many grasslands evolved with few large grazers
- Biological soil crusts beneficial
  - ✓ Protect soil from erosion
  - ✓ Source N fixation

Briske et al. 2011

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Australian Soil Carbon Assessments

Few options exist to increase carbon in infertile, weathered soils with low precipitation (Lam et al. 2013).

- Badgery et al. 2013; SE Australia
- Cowie et al. 2013; NSW Australia
- Allen et al. 2013; NE Australia

Global rangeland C mitigation potential is lower than often implied (Godde et al. 2020).

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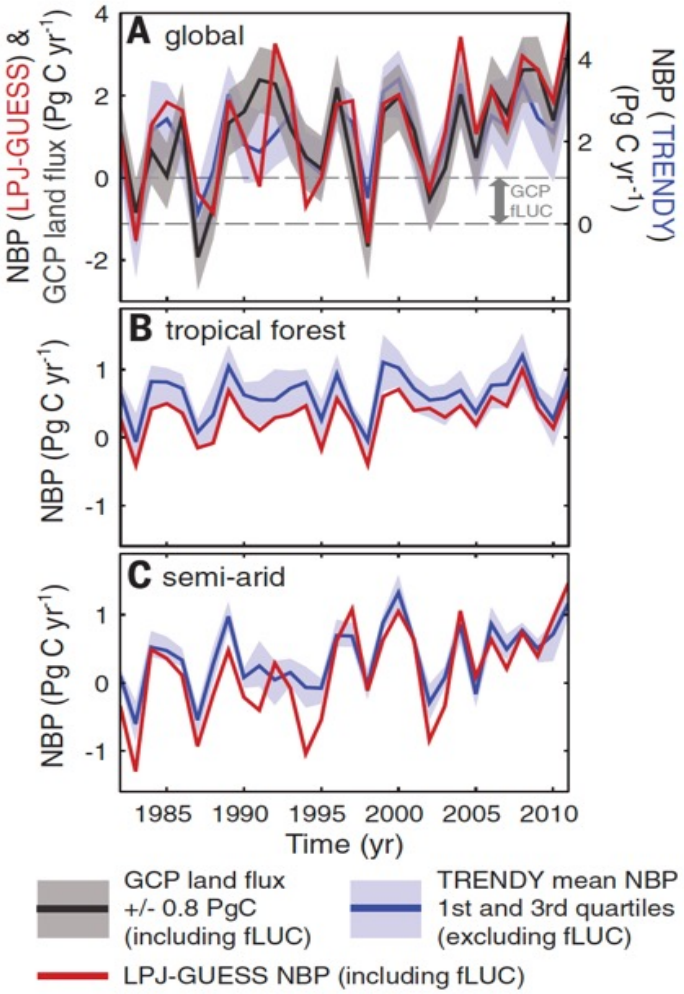
Weather Dependent C Sources & Sinks



Ahlstrom et al. 2015

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Remaining Criticisms of Scientific Evidence

- Contribution of adaptive management to HM has not been investigated.
  - ✓ Adaptive management x grazing system
  - ✓ Stewardship goals have been excluded
- Experimental work done at a small scale
  - ✓ Does not mimic working landscapes
  - ✓ Decision making environment insufficient

Teague et al. 2013
Teague & Barnes 2017

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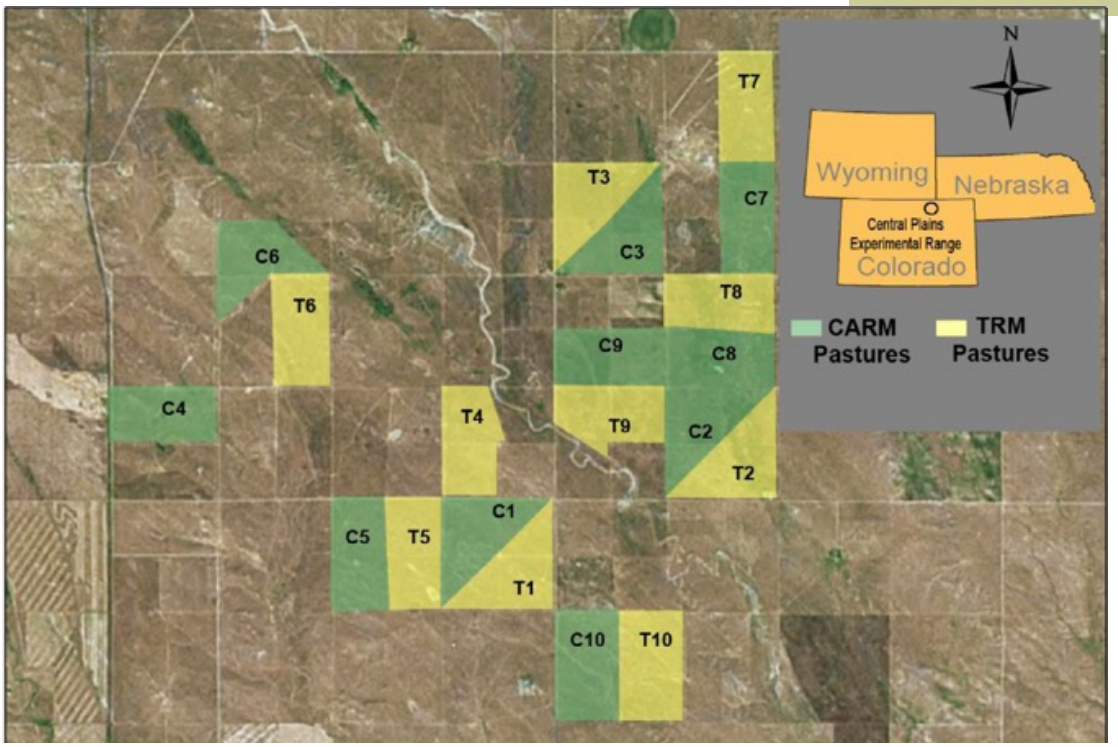
Collaborative Adaptive Range Management

Justin Derner USDA-ARS Research Group



Team Members

David Augustine
Lauren Porensky
M. Fernandez-Gimenez
Hailey Wilmer

Ten - 130 ha paddocks per each of two grazing systems.
CARM adaptively managed with intensive monitoring.
TRM continuous season long continuous grazing.

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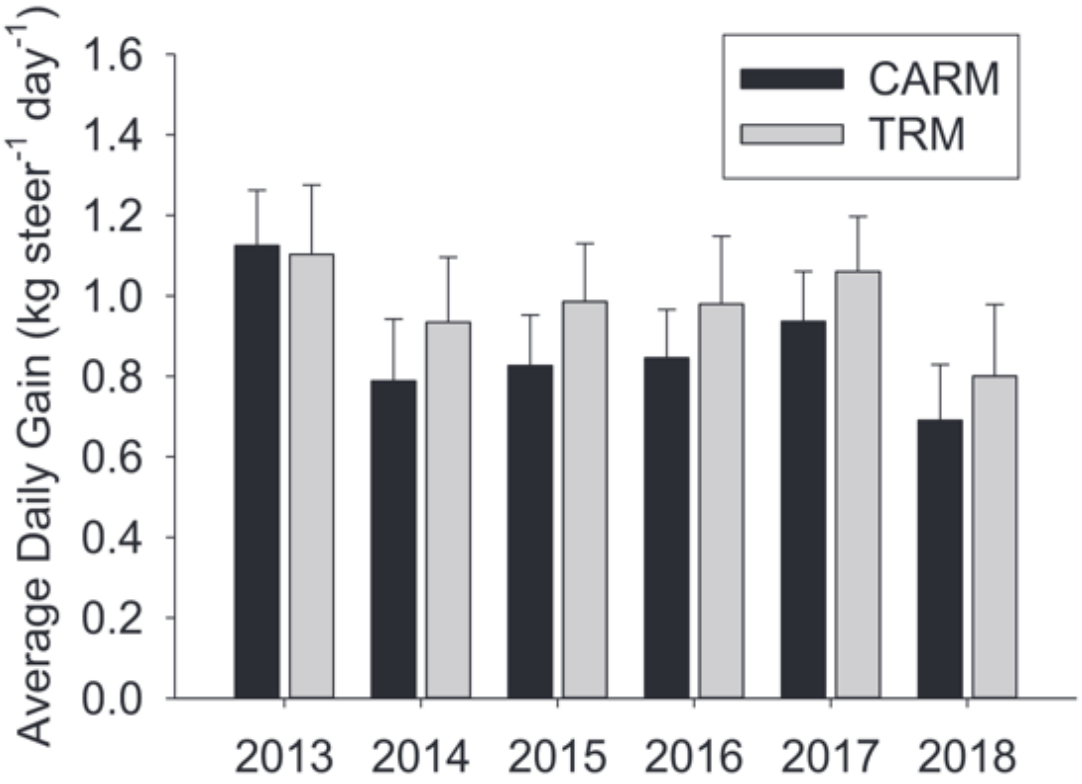
Adaptive Management Evaluated



Augustine et al. 2020
Derner et al. 2020

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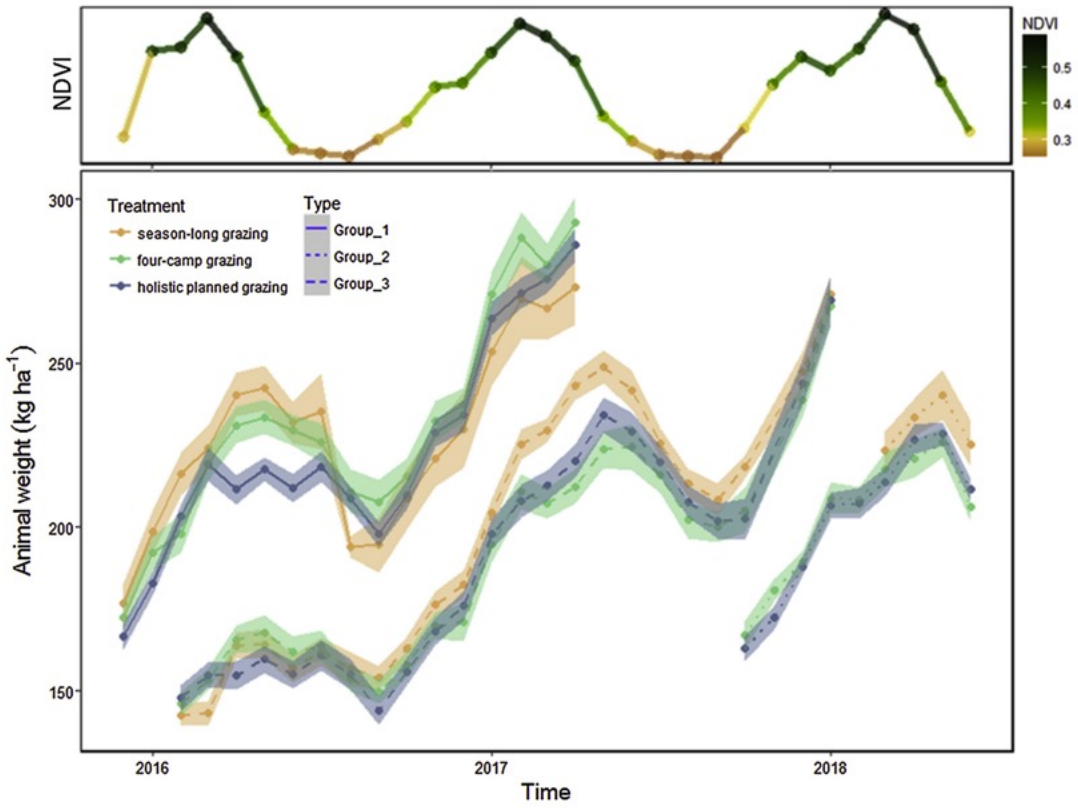
Cattle Production – Merino Walk Farm



Venter et al. 2019

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HM Landscape Assessment

- 48 farms consistently managed for 15 years
- Survey, remotely sensed data & ground truthing
- HDRG similar to neighboring properties for:
  - ✓ Stocking rate
  - ✓ Grass cover
  - ✓ Woody cover
  - ✓ Bare ground

Venter et al. 2019

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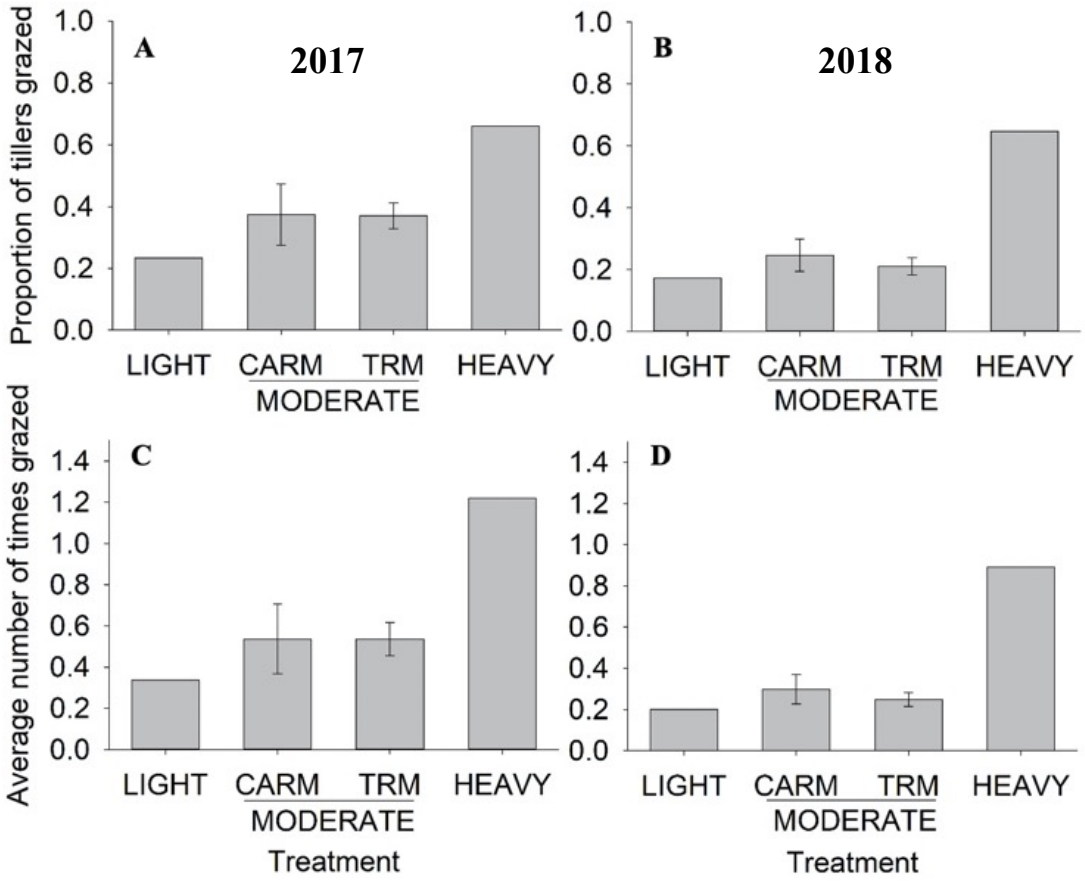
Tiller Defoliation Patterns



Porensky et al. in review

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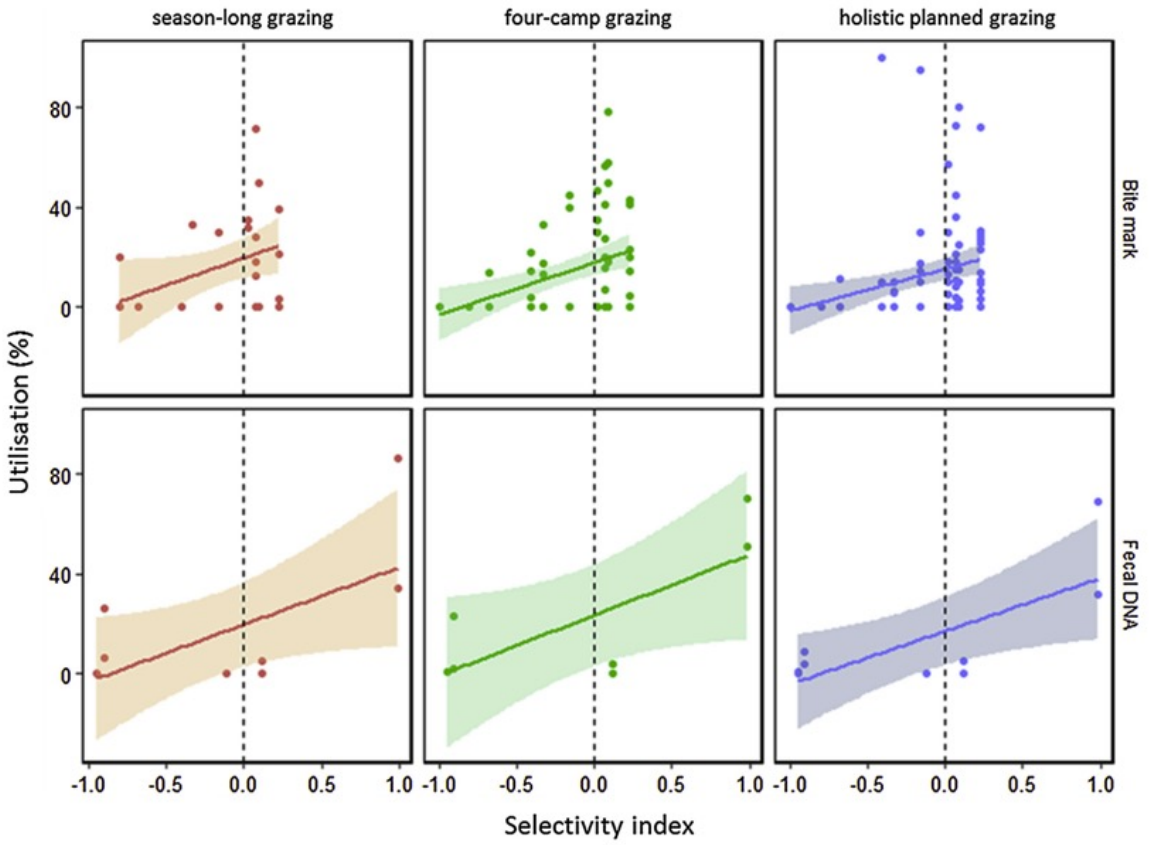
Forage Utilization – Merino Walk Farm



Venter et al. 2019

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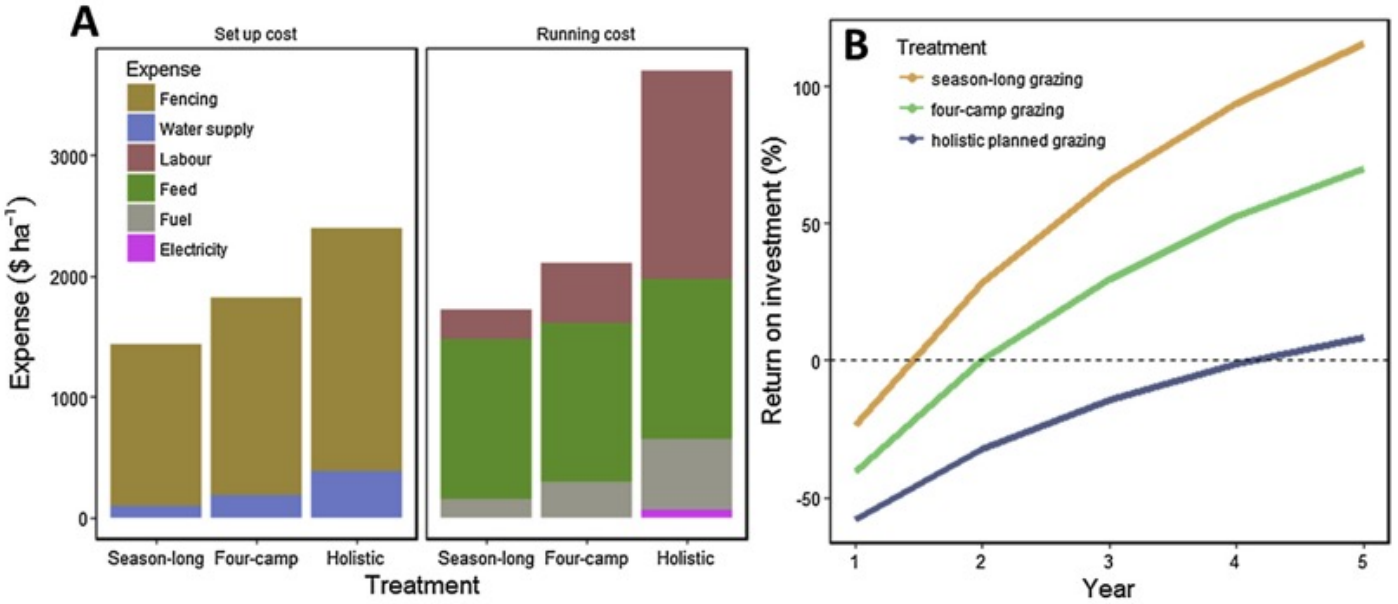
Cost:Benefit Analysis



Grazing system intensification will not yield economic returns on semi-arid rangelands.

Venter et al. 2019
Windh et al. 2019

HM: A Deep Critique

- Why have ecological processes advocated by HM failed?
- Why does HM continue to persist?
- What lessons has our profession learned?
- How should we move forward?

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Grazed Ecosystem Drivers

- Weather/climate
- Stocking rate
- Management decisions
  1) forage inventory, drought management, animal care
  2) agribusiness/economics i.e., labor cost, cost/animal
  3) individual goals, capabilities, and values
- Grazing systems
  1) successive grazing - deferment periods
  2) improved animal distribution and harvest efficiency
  3) moderate SR required to maintain animal production

Briske et al. 2008

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Holistic Management Persistence

- **HM placed grazing management in a social-ecological framework**
  - ✓ Agri-business procedures
  - ✓ Life quality goals & professional identity
- Ranchers valued this contribution more than academics
  - ✓ Empowers ranchers to enhance their capacity
- Continued promotion by multiple entities
  - ✓ Strong testimonials by advocates
  - ✓ Some state and federal agencies

Brunson & Burritt 2009
Sherren & Kent 2017

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Social Science Contributions

- Complex decision making environment of ranchers often unrecognized; complex adaptive systems.
  - ✓ Rangeland management ≠ ecological science
  - ✓ Management goals are diverse and value laden
- Ecologically mechanistic, epistemologically positivist research approach is insufficient
  - ✓ Complex problems do not have objective answers
  - ✓ Constructivist knowledge is required

Wilmer et al. 2017
Gosnell et al. 2020

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Professional Implications

"The RG debate is a symptom of a much greater underlying problem within the rangeland profession—the absence of an adequate framework to evaluate and manage complex adaptive systems involving both social and ecological components" (Briske et al. 2011).

- Social-ecological systems framework essential
- Participatory research and management required
- Emphasize the most important issues
- Transdisciplinary approach may be needed

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Pseudoscience: Another Challenge

Attributes of Pseudoscience

- Use of vague, exaggerated, untestable claims
  - ✓ Exclusivity and lack of boundaries
- Emphasis on confirmation rather than refutation
  - ✓ Appeals to holism not reductionism
- Obsessive focus on a narrow problem
  - ✓ Movement of concentrated livestock herds
- Absence of progress in concept development
  - ✓ Lack of evidence and self correction
- Personalization of issues
  - ✓ Authoritarian personality; attack critics, claims conspiracy

Hansson 2008

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Consequences of Pseudoscience

- More damaging to public than scientific community
  - ✓ Less discerning and skeptical
- Misleading with potential negative outcomes
  - ✓ Oversimplification of rangelands their and management
  - ✓ Direct resource investment toward non-viable approaches
- Division of science and management knowledge
  - ✓ Science-management-policy partnership are needed
  - ✓ Barrier to collaborative adaptive management

NSF S&T Report 2002

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Can We Counter Pseudoscience?

Whom, if not us? If so, what is the best approach?

- Academic objectivity vs advocacy?

Narratives can be extremely powerful!

- Narrative holds a privileged position in human cognition.

Causal attribution to explain the world

- Efficient and satisfying, but not necessarily accurate.

Can scientific community develop counter narratives?

- We are intentionally disadvantaged in this capacity.

Cronon 1992
Rasmussen 2007